Journal of Autism and Developmental Disorders (2021) 51:3506–3513
https://doi.org/10.1007/s10803-020-04814-8

ORIGINAL PAPER

Health Needs and College Readiness in Autistic Students: The Freshman Survey Results

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Accepted: 21 November 2020 / Published online: 1 January 2021
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Abstract

With an increase in the diagnosis of autism spectrum disorder in the United States, many of whom have higher intellectual ability, there is a predicted increase in the number of college-bound students. Affected young adults face a "Services Cliff" as they transition into adulthood. Our study examined a nationally represented sample of freshman students and found that academic achievements in autistic students are comparable to their peers when they first enter college. The students however have more mental health and physical health problems compared to their non-autistic peers. Poor health maybe a major contributing factor to the lower graduation rates among autistic students. College-bound autistic students may continue to require services through college for them to be successful and graduate.

Keywords Autism · College · Health · Achievement

Introduction

The prevalence of Autism Spectrum Disorder (ASD) in the United States is 16.8 per 1000 children aged 8 years (range 13.1–29.3 across 11 sites) according to the most recent estimates from the Autism and Developmental Disabilities Monitoring (ADDM) Network (Maenner 2020). Longitudinal data from the ADDM Network suggests that there has been an increase in ASD prevalence in several communities: from 6.6 per 1000 children in 2002, to 16.8 per 1000 in 2014 respectively (Centers for Disease Control and Prevention 2018). With increasing prevalence of ASD, there has been an increase in the proportion of children who have a higher level of intellectual ability. Estimates from this Network indicate that 44.0% of children with ASD have an average or above average IQ (i.e., >85).

Obtaining a postsecondary education is an important pathway to employment. It is foreseeable that with the reported growing number of autistic[1] children with higher intellectual abilities, a greater proportion will choose to pursue some form of postsecondary education. The National Autism Indicators Report from 2015 showed that 36% of autistic teens receiving special education services during high school went on to obtain some postsecondary education in the form of 2-year college, 4-year college or vocational training (Roux et al. 2015). The graduation rates from postsecondary education however, are much lower among autistic individuals compared to young adults in the general population: 38.8% vs. 52.4% respectively (Newman et al. 2011). While the literature around the reasons behind this disparity is limited, emerging themes reported by autistic students are quite striking. A recent systematic review by Gelbar and colleagues, which looked at college experiences among autistic students, highlighted non-academic difficulties including anxiety, loneliness and depression in several of the reviewed studies (Gelbar et al. 2014). A more recent

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10803-020-04814-8.

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[1] The term "autistic person" has been used throughout this manuscript more often than "personwith autism" in order to respect the preferences of self-advocates.

report, albeit limited by a small sample size, showed a concerning finding that close to 74.6% of the individuals with ASD had lifetime suicidal behaviors (Jackson et al. 2018).

It has been estimated that annual health and education-related costs are $17,000 more for an autistic child compared to a peer without the diagnosis, the cost being higher in those more severely affected (Lavelle et al. 2014). With the large estimated investment made into early childhood, it is discouraging to see that only 36% of autistic teens who received special education services during high school pursued any kind of postsecondary education and only 58% ever worked after high school (Roux et al. 2015). Surprisingly, these rates are much lower than in young adults with other types of disabilities (e.g., learning disability, speech impairment, intellectual disability, etc.) (Newman et al. 2011). In order to improve the return on investment in early childhood education, young adults must receive the appropriate support services to become successful in pursuing higher education and employment.

The National Longitudinal Transition Study-2 (NLTS2) reported that 17.4% of autistic students enrolled in a 4-year college program after graduating high school (Newman et al. 2011). There is a dearth of literature describing the health, college experiences, challenges, and self-perceptions of these students and much less is known about experiences of those who are ultimately successful in graduating from college. The information is crucial while planning, developing and evaluating transitional services in healthcare and student support services on campuses. The purpose of our study is to describe and understand the health characteristics of the population of autistic students who are enrolled in universities across the US. Our hypothesis was that autistic students had comparable physical and mental health characteristics compared to their non-affected peers.

Methods

The data for this study come from four separate administrations of a national freshman survey which is part of a longitudinal study. The freshman survey collects data on incoming first-year college students' pre-college experiences; academic preparation; views on political and social issues; career, educational, and lifelong goals; college choice considerations; and expectations for college. Since its inaugural administration in 1966, more than 15 million students attending more than 1100 institutions have completed the survey.

The analytic sample includes first-time, full-time students enrolled at 4-year nonprofit colleges and universities who completed the survey in 2012, 2014, 2016, or 2018, as these administrations featured questions that requested data regarding diagnosed disabilities and chronic illnesses. The question that identified students with ASD was "Do you have any of the following disabilities or medical conditions?". There were seven answer options including "Learning disability", "Attention deficit hyperactivity disorder", "Autism spectrum disorder", "Physical disability", "Chronic illness", "Psychological disorder" and "Other". The analyses compare the responses of students who indicated being on the autism spectrum with those of their first-time, full-time counterparts who did not indicate having an ASD diagnosis. Population weights are calculated for each survey cohort by considering representation by students' sex, race or ethnicity, and several characteristics of the institutions they attended, including control (i.e., public, private), type (i.e., university, 4-year college), and selectivity level (i.e., average SAT math and SAT verbal scores for the incoming first-year cohort) (Eagan et al. 2017). When applied, the weight adjusts the sample to represent all first-time, full-time, first-year students entering 4-year nonprofit colleges and universities in the United States in 2012, 2014, 2016, and 2018. Of note, because of changes in the SAT scoring system in 2016, we present the SAT Math and SAT Verbal scores in all 4 years and did not include the SAT Writing scores in our analyses.

Data Analysis

The analyses compare first-time full-time self-identified autistic students with their peers who did not report being on the spectrum on a select set of demographic characteristics, emotional and mental health indicators, measures of academic achievement, and items related to confidence in their academic and social skills. Data used was population-weighted and did not control for other disabilities or comorbidities because we wanted to study the difference(s) between first-year college students who report being diagnosed with ASD compared to those without a diagnosis. Many of the items appear as Likert scales, and the analyses for those items use both Chi-square statistics and t-tests to determine whether the autistic sample significantly differs from the comparison group in the proportion of respondents choosing the same value (e.g., frequently, above average/highest 10%) or in the overall mean. For categorical variables (e.g., race/ethnicity, sex, parental education), the analyses compare the proportions in each category between the two samples and rely on chi-square statistics to indicate statistically significant differences. Continuous measures (e.g., standardized test scores, latent construct scores) rely upon t-tests to determine significant differences between the sample means for each group. Several latent constructs were calculated from individual items using item response theory (IRT), which represents a model-based approach for psychometric data analysis. It offers several advantages over traditional factor analysis, which is based on classical test theory. A full discussion of IRT and the corresponding item weights

for all latent constructs have been published previously in a technical report (Sharkness et al. 2010). Additionally effect sizes were calculated on the three latent constructs: 0.2 was considered to be a small, 0.5 a medium and 0.8 a large effect size. The analyses use listwise deletion for cases with missing data. All tests were performed at a 2-tailed alpha level of 0.01.

Results

The sample included students from 379 unique higher education institutions over 4 years, most of which participated in all 4 years of the survey administration. The total unweighted sample included data of 3298 first-time full-time autistic students compared with 577,838 first-time, full-time students who did not report an ASD diagnosis. With the population weights applied, the autistic sample represented 37,026 (0.6%) first-time, full-time students on the spectrum attending 4-year nonprofit colleges and universities in the fall of 2012, 2014, 2016, and 2018. The weighted comparison group represented 5,948,638 first-time, full-time students who did not identify an ASD diagnosis.

Table 1 Demographic information of first-time full-time college students stratified by self-reported diagnosis of Autism Spectrum Disorder (ASD)

	ASD (N = 37,026)	Comparison group (N = 5,948,638)	*P* value
	%	%	
Female	30.5	54.9	0.001
Age			
Under 18	2.1	1.3	0.03
18	62.8	69.9	0.001
19	31.2	26.8	0.001
20	2.6	1.1	0.001
21 or older	1.4	1.1	0.132
Race/ethnicity			
Native American	0.2	0	0.782
Asian	7.4	9.4	0.003
Black	6.7	9.2	0.001
Latino	4.9	10.0	0.001
White	63.9	57.8	0.001
Other	1.3	1.3	0.983
Multi-racial	15.6	12.0	0.001
Political orientation [mean (SD)]	3.31 (0.93)	3.21 (0.83)	0.001
Far right	2.9	1.8	0.001
Conservative	14.5	20.2	0.001
Middle-of-the-road	40.9	45.3	0.001
Liberal	32.4	29.3	0.004
Far left	9.2	3.4	0.001
Parents'/guardians' highest level of education			
HS diploma or less	12.6	17.5	0.001
Bachelor's degree	12.4	14.9	0.004
Some college	36.2	33.5	0.019
Graduate school	38.8	34.0	0.001
Income [mean (SD)]	3.19 (1.57)	3.26 (1.56)	0.055
Under $30,000	18.8	16.8	0.025
$30,000-$59,999	17.1	17.4	0.686
$60,000-$99,999	22.5	22.2	0.831
$100,000-$149,999	18.7	19.4	0.434
$150,000-$249,999	13.7	14.3	0.493
$250,000 or higher	9.3	9.8	0.448

Demographic Information (Table 1, Supplementary Material)

The autistic group was overwhelmingly male (69.5%); by contrast, 45.1% of students in the comparison group identified as male (p value = 0.001). In terms of age distribution of the incoming students, while the majority were 18 years or younger in both groups, autistic students skewed slightly older: 33.8% were 19- and 20-year-olds in the autistic group compared to 27.9% in the comparison group. The racial and ethnic composition included a significantly higher proportion of White students (63.9%) than the comparison group (57.8%, p value = 0.001). Correspondingly, the autistic group featured less racial and ethnic diversity than the students who were not autistic: 6.7% Blacks (9.2% in the comparison group; p value = 0.001) and 4.9% Latinos (10.0% in the comparison group; p value = 0.001). Autistic students held slightly more liberal political orientations compared to their peers. About a third (32.4%) of first-time, full-time autistic freshmen self-identified as being liberal, 40.9% described themselves as "middle-of-the-road" and 14.5% as conservative; by contrast to 29.3% (p value = 0.004), 45.3% (p value = 0.001) and 20.2% (p value = 0.001) respectively in the comparison group. The proportion of parents with graduate education was 38.8% in the autistic group and 34.0% in the comparison group (p value = 0.001). The mean household income did not significantly differ between the two groups.

Physical and Mental Health (Table 2, Supplementary Material)

For physical health, 36.1% rated in the above average/highest-10% range in the autistic group compared to 53.7% in the comparison group (p value = 0.001). In contrast, 20.5% in the autistic group rated themselves as being below average/in the lowest 10% with respect to their physical health compared to 8.8% in the comparison group (p value = 0.001). When it came to rating emotional health, only 30.8% freshmen rated in the above average/highest-10% range in the autistic group compared to 48.6% in the comparison group (p value = 0.001). Among students in the autistic group, 25.8% reported feeling depressed (10.5% in the comparison group, p value = 0.001) and 42.3% reported feeling overwhelmed (36.1% in the comparison group, p value = 0.001). In the autistic group, 28.9% reported a learning disability, 40.9% reported attention deficit hyperactivity disorder and 42.7% reported a psychological disorder, compared to 3.2% (p value = 0.001), 6.0% (p value = 0.001) and 8.8% (p value = 0.001) respectively, among non-affected peers. In addition, 24.3% reported physical disabilities and 18.3% reported chronic diseases in the autistic group which was significantly higher than their peers who reported these 3.8% (p value 0.001) and 2.2% (p value = 0.001) of the time respectively.

Table 2 Health characteristics of first-time full-time college students stratified by self-reported diagnosis of Autism Spectrum Disorder (ASD)

	ASD (N = 37,026) %	Comparison group (N = 5,948,638) %	*P* value
Physical health			
Highest 10%	12.5	19.0	0.001
Above average	23.6	34.7	0.001
Average	43.5	37.5	0.001
Below average	17.9	8.0	0.001
Lowest 10%	2.6	0.8	0.001
Emotional health (above average/highest 10%)	30.8	48.6	0.001
Feelings of (in past year, % indicating "frequently")			
Depression	25.8	10.5	0.001
Being overwhelmed by all s/he had to do	42.3	36.1	0.001
Disabilities or chronic illnesses			
Learning disability	28.9	3.2	0.001
Attention deficit hyperactivity disorder	40.9	6.0	0.001
Psychological disorder	42.7	8.8	0.001
Physical disability	24.3	3.8	0.001
Chronic illness	18.3	2.2	0.001
Other disability	22.7	4.5	0.001

Table 3 Academic characteristics of first-time full-time college students stratified by self-reported diagnosis of Autism Spectrum Disorder (ASD)

	ASD (N = 37,026)	Comparison group (N = 5,948,638)	*P* value
	%	%	
Degree aspirations			
None	2.4	0.6	0.001
Vocational certificate	0.7	0.1	0.001
Associate degree	1.7	0.7	0.001
Bachelor's degree	30.0	22.9	0.001
Master's degree	18.2	19.9	0.001
Law degree	1.9	2.2	0.088
Medical/health-related degree	3.1	5.7	0.001
Doctor of philosophy	8.4	5.9	0.001
Professional doctorate	3.8	3.0	0.049
Other	2.3	1.0	0.001
High school grade point average [mean (SD)]	6.26 (1.45)	6.43 (1.39)	0.001
A−, A, A +	46.0	53.9	0.001
B−, B, B +	47.2	43.0	0.001
C−, C, C +	4.5	3.2	0.001
D+ or lower	0.1	0	0.018
Standardized test scores			
American college testing (ACT) composite [mean (SD)]	25.93 (6.24)	25.5 (5.45)	0.044
Scholastic aptitude test (SAT) math [mean (SD)]	598.77 (123.13)	593.51 (110.14)	0.07
SAT verbal [mean (SD)]	600.42 (117.23)	584.81 (102.76)	0.001
Number of college applications submitted			
One	13.3	11.2	0.003
2–5	46.0	45.2	0.585
6–11	22.9	26.9	0.001
12 or more	7.3	6.7	0.267
Mean (SD)	5.14 (2.94)	5.39 (2.91)	0.001

Academic Aspirations and Achievements (Table 3, Supplementary Material)

Thirty-percent of freshmen in the autistic group and 22.9% in the non-affected group aspired to obtain a Bachelor's degree (p value = 0.001). For higher degrees, 19.9% of freshmen in the comparison group aspired to complete a Master's degree, 5.7% a medical degree, and 2.2% a law degree, compared to 18.2%, 3.1% and 1.9%, respectively in the autistic group. Among other higher degrees, 8.4% in the autistic group aimed at pursuing a Doctor of Philosophy degree (5.9% in the comparison group, p value = 0.001) and 3.8% a professional Doctorate (3.0% in the comparison group). There was no significant between-group difference in standardized test scores [i.e., the American College Test (ACT) Composite scores and the Math and Verbal Scholastic Assessment Test (SAT) scores]. Most students (53.9%) in the comparison group had a high school Grade Point Average (GPA) of A (A−, A, A +), while most students (47.2%) in the autistic group had a High School Grade Point Average of B (B−, B, B +). Both groups applied to a similar number of colleges (close to 6 colleges if we include the college of acceptance).

Academic and Social Skills/Abilities (Table 4, Supplementary Material)

More students in the autistic group self-rated above average/in the highest 10% compared to their non-affected peers in their academic ability (73.0% vs. 70.3% respectively, p value = 0.001). Similarly, autistic students rated themselves significantly higher (p value = 0.001 for all items) than their peers in artistic ability (41.6% vs. 29.6%), computer skills (43.2% vs. 33.4%), creativity (63.1% vs. 53.1%), mathematical ability (50.2% vs. 46.3%), intellectual self-confidence (62.5% vs. 58.1%) and writing ability (54.6% vs. 47.0%). In contrast, students without an ASD diagnosis rated themselves significantly higher (p value = 0.001 for all items) than

Table 4 Self-reported academic and social characteristics of first-time full-time college students stratified by self-reported diagnosis of Autism Spectrum Disorder (ASD)

	ASD (N = 37,026)	Comparison group (N = 5,948,638)	*P* value
	% "Above Average" or "Highest 10%"		
Academic ability	73.0	70.3	0.001
Artistic ability	41.6	29.6	0.001
Competitiveness	43.9	58.2	0.001
Computer skills	43.2	33.4	0.001
Cooperativeness	49.1	69.9	0.001
Creativity	63.1	53.1	0.001
Drive to achieve	62.1	76.8	0.001
Leadership ability	44.8	62.7	0.001
Mathematical ability	50.2	46.3	0.001
Public speaking ability	38.1	38.6	0.001
Intellectual self-confidence	62.5	58.1	0.001
Social self-confidence	27.4	36.1	0.001
Self-understanding	54.6	56.7	0.152
Spirituality	31.9	35.6	0.001
Understanding of others	56.4	71.1	0.001
Writing ability	54.6	47.0	0.001
Compassion	60.7	69.5	0.001
Risk-taking	37.8	44.2	0.001
Academic self-concept latent construct [mean (standard deviation, SD)]	49.14 (10.56)	49.79 (8.81)	0.008
Social self-concept latent construct [mean (SD)]	45.37 (10.61)	49.50 (9.28)	0.001
Pluralistic orientation latent construct [mean (SD)]	47.60 (10.45)	49.95 (9.08)	0.001

the autistic group in competitiveness (58.2% vs. 43.9%), cooperativeness (69.9% vs. 49.1%), drive to achieve (76.8% vs. 62.1%), leadership ability (62.7% vs. 44.8%), social self-confidence (36.1% vs. 27.4%), understanding of others (71.1% vs. 56.4%), compassion (69.5% vs. 60.7%).

Scores on three latent constructs were calculated and reported: the academic self-concept latent construct, the social self-concept latent construct, and the pluralistic orientation latent construct. The mean academic self-concept latent construct was 49.14, social self-concept latent construct was 45.37 and pluralistic self-concept latent construct was 47.60 in the autistic group, compared to 49.79 (p value = 0.008), 49.50 (p value = 0.001), and 49.95 (p value = 0.001), respectively in the comparison group. The effect size was 0.1 for the academic self-concept latent construct, 0.5 for the social self-concept latent construct and 0.3 for the pluralistic orientation latent construct.

Discussion

Ours is the first study describing the health and academic characteristics of freshmen entering 4-year nonprofit colleges and universities all across the US, creating a sufficient sample size for generalizations. The large sample size allowed for robust comparisons to be made between freshmen who self-identified as having ASD and their non-affected peers. Autistic freshmen were more likely to be male, slightly older, White, and to come from households whose parents had a higher level of education compared to their non-autistic peers. These observations are similar to what has been previously reported in the National Autism Indicators Report (Roux et al. 2015).

The most striking differences between the two groups lay in their health. It is well-known that autistic children tend to have associated attention-deficit hyperactivity and psychological disorders (Roux et al. 2015). Our study highlights the fact that in addition to the aforementioned challenges, autistic students report living with chronic illnesses at significantly higher rates than their peers, which tends to get overlooked while studying this population. Given that autistic students reported higher rates of living with chronic illnesses, it should come as no surprise that they rate their physical health significantly lower than their peers in the comparison group. The health disparities are not confined to physical health challenges, as this study highlights the significantly greater frequencies of feeling depressed or overwhelmed in college relative to the comparison group.

Academic achievement in high school was comparable between the two groups. While the autistic group reported

slightly lower high school GPAs, they scored higher than their peers on the SAT Verbal standardized test. Given this context, it is not surprising then that autistic students applied to similar number of colleges and had similar aspirations of pursuing higher education. Overall, the autistic students rated themselves higher in their academic ability, computer skills, and sense of creativity. By contrast, they felt less confident in other necessary aspects of life that ensure successful transition into adulthood, including social self-confidence, competitiveness, and leadership skills, to name a few.

Despite the health limitations faced by autistic students, they have a good academic self-concept, reflecting the return on the resources invested during their school education. However, students in our study had a moderately lower social self-concept and pluralistic self-concept compared to their peers, likely associated with their underlying diagnosis of ASD. The importance of a holistic approach to education which include encouraging inclusivity on campuses and enhancing social skills of students cannot be stressed enough.

Based on these results, we can glean that a contributing factor to non-completion of college graduation in autistic students is likely the lack of support for their health needs. Disclosure of ASD status is voluntary for college students. One study found that nearly one-third of autistic college students did not report seeing themselves as disabled or having a special need even though they had previously been enrolled in special education while in high school (Shattuck et al. 2014). Campuses that do not support autistic students in navigating for needed services may be at higher risk for non-completion for these students. This is particularly problematic, given the likely significant financial investments to date for these students.

The results from this study suggests that college campuses should promote awareness of existing resources for autistic students (health care, mental health, academic support) as well as possibly developing additional resources that may not currently exist (support groups, social events, social skills training). Given the high educational and mental health needs for this group of students, better coordinated services could prevent cases of non-completion.

Finally, primary care for college-bound students should include optimizing the physical and mental health of these students, along with preparation for transition to adulthood. Regular follow-up for these students, similar to the frequency for those with chronic medical conditions, could ensure greater success in college, including higher rates of completion.

This study has several limitations. As with any study analyzing secondary data, the analyses are limited by the variables on the original survey and the sample of students who completed the survey. Many of the items analyzed have a narrow scale, which often ranges from one to three or one to five. The sample of students analyzed here does not include the experiences or perspectives of individuals enrolled at 2-year institutions or anyone who initially enrolls in college part-time. The data come entirely from students' self-reports, and it is possible that some respondents mischaracterized themselves as being on the spectrum while others may have not wanted to disclose their diagnosis. Despite these standard limitations of analyzing secondary data, this study represents the first to consider how a nationally representative sample of incoming 4-year college-bound autistic students compare to their counterparts who do not identify as being on the spectrum.

Acknowledgments We would like to thank Kashia Rosenau and Emily Hotez for their kind review and insights while editing the manuscript.

Funding This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under UJ2MC31073: Autism Transitions Research Project. The information, content and/or conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS or the U.S. Government.

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